IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the Application of: Sture Helmersson et al.	) Examiner: Boyd, Erin M.
	) Confirmation No. 1735
Title: A Spacer and a Fuel Unit for a Nuclear Plant	) Art Unit: 3663
Serial No.: 10/586,032	)
Filed: July 13, 2006	) (Docket No. 1026-0006WOUS)

Middletown, Connecticut, February 22, 2011

U.S. Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

REPLY BRIEF

Dear Sir:

This Reply Brief is respectfully submitted in response to the Examiner's Answer mailed on December 23, 2010. A response to the Examiner's Answer is due on or before February 23, 2011.

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The items required by 37 CFR 41.41 are set forth herein beginning on the following pages, respectively:

(i) STATUS OF CLAIMS

Claims 28, 30, 31, 33, 34, 36-48, 50-52, and 54-57 are pending and are appealed. Claims 1-27, 29, 32, 35, 49 and 53 are canceled.

(ii) GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

I. Whether Claims 28-34, 36, 40-43, 47, 54 and 57 are unpatentable under 35 U.S.C. §103(a) over U.S. Patent No. 5,875,223 to Nylund (hereinafter referred to as "Nylund") in view of U.S. Patent No. 5,331,679 to Hirukawa (hereinafter referred to as "Hirukawa").

II. Whether Claims 37, 38 and 39 are unpatentable under 35 U.S.C. §103(a) over Nylund and Hirukawa as applied to Claim 28 and further in view of U.S. Patent No. 6,901,128 to Mori et al. (hereinafter referred to as "Mori et al.").

III. Whether Claims 48 and 51 are unpatentable under 35 U.S.C. §103(a) over Nylund, Hirukawa, and Mori et al. as applied to Claim 37 and further in view of U.S. 5,272,741 to Masuhara et al. (hereinafter referred to as "Masuhara et al.").

IV. Whether Claims 44-46 are unpatentable under 35 U.S.C. §103(a) over Nylund and Hirukawa, as applied to Claim 28 and further in view of U.S. Patent No. 4,800,061 to Shallenberger et al. (hereinafter referred to as "Shallenberger et al.").

V. Whether Claims 50 and 52 are unpatentable under 35 U.S.C. §103(a) over Nylund and Hirukawa as applied to Claim 28 and further in view of Masuhara et al.

VI. Whether Claims 55 and 56 are unpatentable under 35 U.S.C. §103(a) over Nylund and Hirukawa as applied to Claim 28 and further in view of U.S. Patent No. 5,778,035 to Nylund (hereinafter referred to as "Nylund (2)").

(iii) **APPELLANTS' ARGUMENTS**

Claims 28, 30, 31, 33, 34, 36, 40-43, 47, 54 and 57 are rejected under 35 U.S.C. §103(a) as allegedly unpatentable over U.S. Patent No. 5,875,223 to Nylund (hereinafter referred to as "Nylund") in view of U.S. Patent No. 5,331,679 to Hirukawa (hereinafter referred to as "Hirukawa"). Appellants maintain the traversal of this rejection and reiterate the remarks contained in the Appeal Brief. In addition to the remarks provided in the Appeal Brief, Appellants request entry and consideration of the following remarks that address the Examiner's arguments outlined in Section 10 of the Examiner's Answer.

At p. 25 of the Examiner's Answer, it is alleged that a wave configuration at the downstream edge (i.e., the upper edge) would facilitate the catching of debris, and prevent debris from reaching the fuel rod. To support this allegation, the Examiner refers to Nylund, col. 2, lines 21-26, where this advantage is allegedly discussed. Specifically, the Examiner states "Nylund teaches that a spacer with a wavy configuration on its lower edge prevents foreign matter from contacting the fuel rod from the upstream direction (column 2, lines 21-26)." Examiner's Answer, p. 25. Appellants respectfully disagree with the Examiner's understanding of Nylund.

Nylund, at col. 2, lines 21-26 recites "[b]y forming the spacer with a wavy edge, it can be given a low flow resistance while at the same time foreign matter which adheres to the upstream edge of the spacer is efficiently captured and oriented such that it does not make contact with and thus does not cause wear on the elongated elements."

Accordingly, Nylund is discussing the design of the ***upstream edge*** (i.e., the lower edge) and not the downstream edge (i.e., the upper edge) as alleged by the Examiner.

Since the flow of coolant water including all possible debris will reach the upstream edge (i.e., the lower edge), the configuration of the upstream edge is relevant in preventing debris from getting caught by the spacer sleeve. The configuration of the downstream edge (i.e., the upper edge) is of no significance regarding catching of debris. Since the flow of coolant will flow away from the upper edge, possible debris contained therein will also be transported away from the upper edge. The configuration of the downstream edge, i.e., the upper edge, does not influence the behavior of possible debris contained in the coolant.

On pp. 25-26 of the Examiner's Answer, the Examiner alleges that Nylund and Hirukawa belong to the same technical field. Appellants respectfully submit the Examiner's conclusion is only partially correct since Nylund and Hirukawa have completely different purposes. Appellants submit that Nylund aims to reduce the risk for debris to get caught in the spacer. *See* Nylund at col. 1, line 61 to col. 2, line 2. On the other hand, Hirukawa aims at imparting a swirling force and at reducing the pressure drop over the sleeve and the spacer. *See* Hirukawa at col. 1, line 65 to col. 2, line 2 and col. 9, lines 5-15. The possible resemblance of the solutions offered in Nylund and Hirukawa is therefore incidental since the shape of the edges in each cited reference are provided for completely different reasons.

On p. 16, paragraph 3 of the Appeal Brief, Appellants state that "while Nylund might show that the sleeves are connected to each other along a connection area extending from the upper edge to the lower edge, Nylund fails to disclose or suggest that the connection areas extend between one of the wave valleys on the upper edge and one of the wave valleys of the lower edge, as recited in the instant Claims." Appellants continue the argument by stating:

> Additionally, and in contrast to the assertions of the Examiner, Appellants submit that Hirukawa also fails to disclose or suggest a sleeve having an upper and lower edge, the upper edge, seen transversely to the longitudinal axis, has a wave-like shape with wave peaks, which are aligned with a respective one of said abutment surfaces, and with wave valleys located between two adjacent ones of said abutment surfaces, and that the connection areas extend substantially parallel to the longitudinal axis between one of the wave valleys lower edge and one of the wave valleys of the upper edge, as recited in the instant Claims. Appeal Brief, pp. 16-17

In response to Appellants' remarks concerning the connection area in Nylund, the Examiner states that "one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references." Examiner's Answer at p. 27. Appellants respectfully submit that it is important (and a required factual inquiry) to establish which features are known from which documents before one can proceed with an analysis of whether the combination of the documents would lead a person of ordinary skill in the art to the claimed invention. *See* MPEP §2141.

The lack of disclosure of Nylund noted by the Appellants in the Appeal Brief is a point made by Appellants in analyzing the obviousness rejection under 35 USC §103. The currently pending claims recite, *inter alia,* a sleeve having an upper and lower edge, the upper edge, seen transversely to the longitudinal axis, has a wave-like shape with wave peaks, which are aligned with a respective one of said abutment surfaces, and with wave valleys

located between two adjacent ones of said abutment surfaces, and that the connection areas extend substantially parallel to the longitudinal axis between one of the wave valleys lower edge and one of the wave valleys of the upper edge. A consequence of this feature is thus that the two edges are fully symmetric to each other with respect to a mid plane for which the longitudinal axis forms a normal.

Nylund does not disclose these features recited in the instant claims. Neither does Hirukawa. Moreover, Hirukawa does not disclose a symmetric design of the two edges, and a person skilled in the art can therefore not be taught or motivated by Hirukawa to amend the configuration of Nylund and thereby arrive at the claimed subject matter.

Concerning the Examiner's statement that Appellants contradict themselves on p. 17, paragraphs 3 and 4 of the Appeal Brief, Appellants respectfully disagree. *See* Examiner's Answer at p. 27, second paragraph. Specifically, the Examiner is of the opinion that Appellants contradict themselves since in the instant specification Appellants describe the content of Hirukawa by discussing its "wave-like shape." *See* instant application at paragraph [0012]. Appellants note the discussion of Hirukawa in the instant application mentions that Hirukawa has a "wave-like shape" which is distinctly different from the instant claims, which include the precise expression "wave shape". It is clear that Hirukawa does not disclose such a wave shape as is recited in the instant claims. Rather, Hirukawa discloses a more irregular shape where the petal portions have different shapes at the upper edge and the lower edge and also around the upper and lower edges.

In the Examiner's Answer on p. 27, paragraphs 3 and 4, the Examiner states it is irrelevant whether or not there are upper peaks in addition to the two peaks illustrated in figure 13 of Hirukawa, but notes that figure 13 may be a partial illustration and should not be interpreted as only having two upper peaks, especially since figures 4 and 10 show four upper peaks.

Appellants respectfully submit the Examiner cannot insert elements into figures that are not shown in the figures or described to be in such figures. Accordingly, the Examiner cannot simply import additional peaks that are shown in FIGS. 4 and 10 to an embodiment of the sleeve depicted in FIG. 10 that only includes two peaks on its upper edge. Therefore, Appellants reiterate that FIG. 13 of Hirukawa shows only two "peaks," which are both of triangular shape and located relatively close to each other. It does not appear from FIG. 13

that there would be such "peaks" also at the rear side of the sleeve, nor does the specification of Hirukawa confirm existence of such peaks.

The Examiner states that the instant "claims do not recite that the peaks at the upper edge are aligned with the peaks at the lower edge. The claims actually recite that the peaks at the upper and lower edges are aligned with an abutment surface." Examiner's Answer at p. 28, paragraph 2. Appellants respectfully disagree with the Examiner's understanding of the instant claims.

Independent claims 28 and 57 each recite, *inter alia:*

> wherein the upper edge, seen transversely to the longitudinal axis, has a wave shape with wave peaks, which are aligned with a respective one of said abutment surfaces, and with wave valleys located between two adjacent ones of said abutment surfaces, each of said elongated abutment surfaces extending from a respective one of said wave peaks of the upper edge to a respective one of said wave peaks of the lower edge . . . .

It is clear from this recitation that since the abutment surface extends from a wave peak of the upper edge to a wave peak of the lower edge. Accordingly, it follows that the wave peaks of the upper edge are aligned with the wave peaks of the lower edge. A consequence of the claim recitations is that the wave peaks at the upper edge, and the wave peaks at the lower edge are aligned with each other along a line being parallel with the longitudinal axis. Another consequence of this configuration is the symmetry discussed above.

Additionally, regarding the Examiner's conclusion that the combination of Nylund and Hirukawa would lead to a configuration where the wave peaks are aligned with each other, Appellants respectfully submit that such conclusion is based on an after the fact analysis which can only be reached upon the benefit of the review of the instant application, and therefore constitutes an impermissible hindsight analysis. *See* MPEP §2145 X.A. The Appellants reiterate that there is no basis for any teaching in either Nylund or Hirukawa, taken alone or in any combination, which could lead a person of ordinary skill in the art to the precisely claimed configuration.

On pp. 28-29 of the Examiner's Answer, it is alleged that Appellants contradict themselves with respect to a statement in the specification of the instant application. Specifically, at p. 18 of the Appeal Brief, the Appellants state "[t]his is especially in view of

the fact that neither of the cited references discloses or suggests wave shapes on both the upper and lower edges of a sleeve." The Examiner is of the opinion that Appellants contradict themselves since in the instant specification Appellants describe the content of Hirukawa by discussing its "wave-like shape." *See* instant application at paragraph [0012].

As discussed above, Appellants note the discussion of Hirukawa in the instant application mentions that Hirukawa has a "wave-like shape" which is distinctly different from the instant claims, which include the precise expression "wave shape". It is clear that Hirukawa does not disclose such a wave shape as is recited in the instant claims. Rather, Hirukawa discloses a more irregular shape where the petal portions have different shapes at the upper edge and the lower edge and also around the upper and lower edges.

In the Examiner's Answer, the Examiner disagrees with the Appellants' multi-step process that is required to modify the prior art. Appellants' multi-step process is discussed at pp. 18-20 of the Appeal Brief. Appellants maintain this argument and reiterate the arguments herein by incorporation by reference.

In addition to the arguments put forth in the Appeal Brief, Appellants further submit that Hirukawa discloses sleeves with a plurality of features, and there is nothing in Hirukawa or Nylund which indicates to a person of ordinary skill in the art to select specific features of Hirukawa and combine the same with Nylund so that her would arrive at the subject matter of the instant claims.

Appellants further submit that the short abutment surfaces of Hirukawa are logical in view of the purpose of Hirukawa, namely to provide a sleeve which has a low pressure drop and which is for providing a swirling of the coolant. With this purpose, it is logical that the main part of the sleeve is provided at a distance from the fuel rod, *i.e.*, that only small parts of the sleeve material extends into and abuts the fuel rod.

In contrast, the present invention aims at long, and prolonged abutment surfaces in comparison with the prior art. The long abutment surfaces will ensure a long axial abutment line against the fuel rod. Such a long abutment is advantageous in order to reduce wear of the cladding tube of the fuel rod. *See* Instant Specification at least at "Summary". Furthermore, as already discussed, the relatively short distance between the wave valleys provides for the desired flexibility enabling the abutment surfaces to move radially inwardly, and outwardly and to follow possible movements of the fuel rods during operation of the reactor.

Based on the above remarks coupled with Appellants' arguments submitted in the Appeal Brief, Appellants submit the instant claims are novel and non-obvious over Nylund and Hirukawa, either taken alone or in any combination. Accordingly, Appellants respectfully request withdrawal of the instant rejection.

With respect to the remaining prior art rejections under 35 USC §103(a) as listed in section (ii) above, Appellants reiterate and incorporate by reference the remarks put forth in the Appeal Brief pertaining to such rejections. In addition to the remarks put forth in the Appeal Brief, and with respect to the rejection of Claims 37, 38 and 39 as allegedly obvious over Nylund and Hirukawa and further in view of Mori et al., Appellants note that Mori et al. does not refer to a spacer but to a debris filter, or foreign matter filter, to be provided beneath the fuel rods in the fuel assembly. Such filters are not provided for supporting the fuel rods in the fuel assembly.

Furthermore, with respect to the rejections of Claims 44-46 as allegedly obvious over Nylund, Hirukawa and Shallenberger et al., Appellants submit that Shallenberger et al. does not refer to the thickness of the spacer and the sleeve, but to the thickness of a thin-walled metallic tubular member to be used during insertion of the fuel rod into the fuel assembly. It is clear to a person of ordinary skill in the art that the thin-walled metallic tubular member will not remain in the fuel assembly when loaded in to the reactor.

CONCLUSION

In view of the remarks submitted herein as well as in the Appeal Brief, Appellants respectfully submit that the stated rejections of the pending claims have been shown to be unsustainable. Accordingly, Appellants respectfully request reconsideration and withdrawal of the outstanding rejections.

Appellants believe that no additional fees are due with the submission of this Reply Brief. However, if an additional fee is due, Appellants authorize the payment of any additional charges that may be necessary to maintain the pendency of the present application to the undersigned attorney's Deposit Account No. 503342.

Respectfully submitted,

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(iv) CLAIMS APPENDIX

1-27. (Canceled)

28. (Previously Presented) A spacer for holding a number of elongated fuel rods intended to be located in a nuclear plant

the spacer enclosing a number of cells, each cell having a longitudinal axis and arranged to receive a fuel rod in such a way that the fuel rod extends substantially in parallel with the longitudinal axis,

each cell being formed by a sleeve, having an upper edge and a lower edge,

the sleeve including a number of elongated abutment surfaces, which project inwardly towards the longitudinal axis and extend substantially in parallel with the longitudinal axis for abutment to the fuel rod to be received in the cell, and

the lower edge, seen transversely to the longitudinal axis, having a wave shape with wave peaks, which are aligned with a respective one of said abutment surfaces, and wave valleys located between two adjacent ones of said abutment surfaces;

wherein the upper edge, seen transversely to the longitudinal axis, has a wave shape with wave peaks, which are aligned with a respective one of said abutment surfaces, and with wave valleys located between two adjacent ones of said abutment surfaces,

each of said elongated abutment surfaces extending from a respective one of said wave peaks of the upper edge to a respective one of said wave peaks of the lower edge, and

the sleeves abut each other in the spacer along respective connection areas, each extending substantially parallel to the longitudinal axis between one of said wave valleys of the upper edge and one of said wave valleys of the lower edge.

29. (Canceled)

30. (Previously Presented) A spacer according to claim 28, wherein each sleeve includes at least four of said abutment surfaces.

31. (Previously Presented) A spacer according to claim 28, wherein each of said abutment surfaces is formed by a respective ridge projecting inwardly towards the longitudinal axis.

32. (Canceled)

33. (Previously Presented) A spacer according to claim 28, wherein the sleeves are permanently connected to each other by means of weld joints.

34. (Previously Presented) A spacer according to claim 28, wherein said sleeves are permanently connected to each other by means of weld joints, wherein said weld joints include an edge weld at said connection area at at least one of the upper edge and the lower edge.

35. (Canceled)

36. (Previously Presented) A spacer according claim 28, wherein substantially each sleeve is manufactured of a sheet-shaped material that is bent to the sleeve shape.

37. (Previously Presented) A spacer according to claim 36, wherein the sheet-shaped material before said bending has a first connection portion in the proximity of the a first end of the sheet-shaped material and a second connection portion in the proximity of a second end of the sheet-shaped material, wherein the first end overlaps the second end of the sleeve after said bending.

38. (Previously Presented) A spacer according to claim 37, wherein the first connection portion and the second connection portion are permanently connected to each other by means of at least one weld joint.

39. (Previously Presented) A spacer according to claim 38, wherein said weld joint includes a spot weld.

40. (Previously Presented) A spacer according to claim 28, wherein substantially each sleeve is manufactured from a tubular material which is worked to the wave shape of the upper edge and the lower edge.

41. (Previously Presented) A spacer according to claim 28, wherein the sleeve seen in the direction of the longitudinal axis has four substantially orthogonal long sides, wherein each long side includes one of said abutment surfaces.

42. (Previously Presented) A spacer according to claim 41, wherein each long side includes one of said wave peaks of the upper edge and one of said wave peaks of the lower edge.

43. (Previously Presented) A spacer according to any claim 41, wherein the sleeve, seen in the direction of the longitudinal axis, has four substantially orthogonal short sides, wherein each short side connects two of said long sides and includes a portion of one of said wave valleys of the upper edge and a portion of one said wave valleys of the lower edge.

44. (Previously Presented) A spacer according to claim 36, wherein the sleeve has a thickness of the material, which is less than 0.24 mm.

45. (Previously Presented) A spacer according to claim 36, wherein the sleeve has a thickness of the material, which is less than or equal to 0.20 mm.

46. (Previously Presented) A spacer according to claim 36, wherein the sleeve has a thickness of the material, which is less than or equal to 0.18 mm.

47. (Previously Presented) A spacer according to claim 28, wherein the nuclear plant is arranged to permit re-circulation of a coolant flow and wherein the spacer is arranged to be located in the coolant flow, the spacer including at least one vane for influencing the coolant flow.

48. (Previously Presented) A spacer according to claim 37, wherein the nuclear plant is arranged to permit re-circulation of a coolant flow, wherein the spacer is arranged to be located in the coolant flow, and wherein the spacer includes at least one vane for influencing the coolant flow, said vane being formed by a portion of the material, which extends from the first connection portion.

49. (Canceled)

50. (Previously Presented) A spacer according to claim 47, wherein the sleeve includes a slit, which extends from at least one of the upper edge and lower edge and which permits outward bending of a part of the sleeve for forming said vane.

51. (Previously Presented) A spacer according to claim 48, wherein said vane is inclined in relation to the longitudinal axis.

52. (Previously Presented) A spacer according to claim 47, wherein the sleeve seen in the direction of the longitudinal axis has four substantially orthogonal long sides, wherein said vane extends outwardly from one of said long sides.

53. (Canceled)

54. (Previously Presented) A spacer according to claim 28, wherein the spacer, seen in the direction of the longitudinal axis, has a substantially rectangular shape and includes at least two separate outer edge elements which extend along a respective side of the spacer.

55. (Previously Presented) A spacer according to claim 54, wherein one of the four corners of the rectangular shape is reduced through the lack of outer sleeve, and that the spacer includes a separate inner edge element, which extends along two of said sides and along said reduced corner.

56. (Previously Presented) A spacer according to claim 55, wherein the inner edge element includes a vane, which is located at said reduced corner and which is inclined upwardly and inwardly towards a centre of the spacer.

57. (Previously Presented) A fuel unit for a nuclear plant including a number of elongated fuel rods and a number of spacers for holding the fuel rods, wherein

each of the spacers enclose a number of cells, which each have a longitudinal axis and is arranged to receive one of said fuel rods in such a way that the fuel rod extends in parallel to the longitudinal axis,

each cell is formed by a sleeve, which has an upper edge and a lower edge,

the sleeve includes a number of elongated abutment surfaces, which project inwardly towards the longitudinal axis and extend substantially in parallel with the longitudinal axis for abutment to the fuel rod to be received in the cell;

the lower edge, seen transversely to the longitudinal axis, has a wave shape with wave peaks, which are aligned with a respective one of said abutment surfaces, and wave valleys located between two adjacent ones of said abutment surfaces;

wherein the upper edge, seen transversely to the longitudinal axis, has a wave shape with wave peaks, which are aligned with a respective one of said abutment surfaces, and with wave valleys located between two adjacent ones of said abutment surfaces,

each of said elongated abutment surfaces extending from a respective one of said wave peaks of the upper edge to a respective one of said wave peaks of the lower edge, and the sleeves abut each other in the spacer along respective connection areas, each extending substantially parallel to the longitudinal axis between one of said wave valleys of the upper edge and one of said wave valleys of the lower edge.